

# **SUNY-ESF**

**Improve Your World**



## **Academic Program Guide 2014-15**

State University of New York College of Environmental Science and Forestry

# Academic Programs at SUNY-ESF



The State University of New York College of Environmental Science and Forestry (SUNY-ESF) offers 25 undergraduate and 30 graduate degree programs to choose from, including associate, bachelor's, master's and doctoral degrees focused on the science, engineering, design, and management of natural resources and the environment. This Academic Program Guide describes the Bachelor of Science (B.S.) and Bachelor of Landscape Architecture (B.L.A.) degree programs offered by the College during the 2014-15 academic year and is intended to help prospective undergraduate students select a major that is well-suited to their personal and professional interests.

Students are encouraged to seek additional academic information, including specific degree requirements and course descriptions, by consulting the 2014-15 College Catalog available on the Web at [www.esf.edu/catalog](http://www.esf.edu/catalog).





## Aquatic and Fisheries Science

[www.esf.edu/efb/fisheries](http://www.esf.edu/efb/fisheries)

Aquatic and fisheries science is the study of aquatic ecosystems to increase scientific understanding and to apply basic ecological principles to their management, thereby sustaining them for multiple uses. Aquatic ecosystems include wetlands, streams, lakes, estuaries and oceans. Aquatic science professionals study and manage valued natural systems for seafoods, drinking water, recreation, transportation and aesthetics.

Undergraduate students considering a career in aquatic and fisheries science need a solid foundation of basic sciences (math, chemistry, physics, statistics) combined with a broad training in organismal biology, ecology and evolution. Upper-division courses focus more specifically on aquatic systems and fishes, including field experience, methods of assessment and principles for management. Students interested in marine science can earn credits through a 12-week SEA semester program (see [www.sea.edu](http://www.sea.edu)). Other recommended subjects include communications, ecosystem science, social and economic principles, ecological modeling, and hydrology.

ESF's many field stations provide important opportunities for field-oriented studies, both for taking formal courses and for directed independent research. Practical experiences such as a senior synthesis or internship also provide an important complement to formal courses.

Career opportunities for students with a B.S. in aquatic and fisheries science are in the areas of fisheries science, wetland science, limnology, marine biology and oceanography. Jobs are with federal and state agencies, research institutions, private consulting firms and non-governmental organizations, both local and international. The best students will have opportunities to continue with graduate studies, which will broaden career options and lead to positions with greater responsibility and higher salary.

## Bioprocess Engineering

[www.esf.edu/bpe](http://www.esf.edu/bpe)

The bioprocess engineering program prepares students for careers as engineers in a variety of related fields, filling positions that are typically filled by chemical engineers with bioprocess training. As we begin the 21st century, growth and development worldwide will need to be done in an ecologically-friendly manner that looks to the long-term future of the environment.

Bioprocess engineers focus on developing products and energy from sustainable sources, especially from wood and other lignocellulosic materials rather than non-renewable sources such as fossil fuels.

Examples of such technology include the production of ethanol, butanol, acetic acid, polymers, and other products that have traditionally been produced from fossil fuels such as oil, coal, and natural gas.

Students gain valuable experience through a capstone design experience in which they work on significant problems in the design and implementation of new technologies. In addition, a summer internship is required of all students.

### Bioprocess Engineering Concentration Areas

Students enrolled in the bachelor of science program in bioprocess engineering may choose from the following concentration areas to gain additional specialized training:

- Biochemical Engineering
- Bioenergy Engineering
- Biomaterials
- Biomolecular Engineering
- Biopolymer Engineering
- Environmental Engineering
- Industrial Engineering
- Paper Engineering

### Internships, Co-ops, and Research Experiences

Bioprocess engineering students enjoy the advantage of hands-on learning in the bioprocess and allied industries through internships and co-ops. All students are required to complete a two-credit internship, co-op, or research program in the industry. Internships provide students with valuable experience, financial benefits, and two credits toward graduation.

Students who complete a co-op work assignment in addition to the 12-week internship find the experience highly valuable because they are often able to see engineering projects through to their completion. Generally, students who have had the co-op experience are more highly recruited for permanent employment.

The co-op position, when taken in conjunction with the summer internship, consists of a work period approximately seven months in duration, either beginning in May and ending in December, or beginning in January and ending in August. Students who complete a co-op normally take one extra year to complete the degree requirements.

### Program Accreditation and Licensure

The bioprocess engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). Students normally take the Fundamentals of Engineering exam during their senior year and upon passing become an Engineer-in-Training. After four additional years of engineering practice, graduates are eligible to complete examination requirements to become a Professional Engineer (PE).

## Biotechnology

[www.esf.edu/efb/biotech](http://www.esf.edu/efb/biotech)

Biotechnology is the application of biological organisms, cells, or molecules to create products or services for the betterment of humans. The bachelor of science degree in biotechnology prepares students to tackle environmental, natural resource, agricultural and medical problems through training in molecular biology, cell biology, biochemistry, genetic engineering and related biological disciplines. As biotechnology is increasingly used to address such issues, it offers diverse career opportunities.

The curriculum emphasizes the basic sciences with a strong foundation in biology, chemistry, calculus, and physics that prepares students for upper-level biology and chemistry courses, but encourages elective breadth in the social sciences, humanities, and environmental studies. The degree program provides sufficient breadth for a student to enter a clinical medical career or other health profession. Students who complete this major will be qualified to enter the growing biotechnology-related job market or continue their studies in graduate or professional school.

The biotechnology major features a strong practical experience component. Each student is required to fulfill an internship, which could be in a local, national, or international company, medical unit, or government research laboratory. The objective of this internship is to give students experience working outside a purely academic setting.

In addition, each student is required to perform one independent research project in a local, national, or international academic laboratory. The objective of the research requirement is to teach the student to develop and meet a research goal using the scientific method. During the senior year, each student is required to complete a senior project synthesis in which the results from their internship or independent research—or both—will be organized and presented as a seminar or poster.

## Chemistry

[www.esf.edu/chemistry](http://www.esf.edu/chemistry)

The Department of Chemistry offers three options leading to the bachelor of science degree: biochemistry, environmental chemistry and polymer chemistry. Each option offers an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum. All options are excellent preparation for professional work at the B.S. level or for advanced graduate study.

## Biochemistry

Biochemistry stresses a chemical approach to problems in the life and health sciences. After obtaining a strong foundation in analytical, physical and organic chemistry, these studies are supplemented by advanced courses in natural products chemistry, natural biopolymers, spectroscopy, and biochemistry. Professional electives in botany, chemical ecology, genetics and molecular biology provide the background for interactions in the life and health sciences. Research areas include the elucidation of chemical signals by which organisms communicate with each other, the role of trace metals in the growth of microorganisms, and the origin and function of biologically active natural compounds.

## Environmental Chemistry

Environmental chemistry stresses applications of fundamental chemical principles to describe and predict behavior of chemicals in the environment. Courses in air and water chemistry are supplemented by advanced courses in analytical, physical, or organic chemistry. A wide variety of courses in biology, engineering, geology, and environmental policy are also available. Research areas include phase partitioning of organic compounds in water, characterization of particles in air and water, atmospheric and smog chemistry, aqueous photochemistry, sampling methods for trace contaminants in air and water, biological alkylation of metals, analysis of organic particles in water, characterization of natural organic matter in soil and water, behavior of major ions and nutrients in water, and global change.

## Polymer Chemistry

Undergraduates in the polymer chemistry option take courses in mechanisms of polymerization and polymer synthesis, in the physical properties and characterization of polymers, and in the laboratory techniques of polymer synthesis and characterization. Special topics courses in contemporary polymer and material science are available as electives. In addition, courses in carbohydrate chemistry provide a solid background for chemists planning careers in paper, textiles, membranes, and related areas. Biochemistry is an appropriate elective for students interested in the growth of biotechnologies while environmental chemistry complements this program for students interested in working on problems of chemical waste. The program offers an excellent background both for direct entry into industrial chemistry and graduate study in areas such as chemistry, biotechnology or polymer science.

## Conservation Biology

[www.esf.edu/consbio](http://www.esf.edu/consbio)

Conservation biology is the application of science to conserve the earth's imperiled species and ecosystems. The field is a relatively young one that is growing rapidly in response to the biodiversity crisis, perhaps the most critical environmental issue of our time. Conservation biologists view all of nature's diversity as important and having inherent value. This diversity spans the biological hierarchy and includes variation at the level of genes, populations, communities, ecosystems, and biomes.

A focus on biological diversity and an intrinsic valuation of nature is what distinguishes conservation biology from wildlife management (with its somewhat more utilitarian perspective and a focus on populations of birds and large mammals) and from general environmental biology (with a broad focus on environmental issues). Conservation biologists seek ways to integrate biological perspectives with social, economic, legislative and political ones to achieve conservation goals. The courses associated with this major reflect the interdisciplinary and holistic nature of conservation biology. After obtaining a foundation in basic science, communication, and general education subjects, students learn the evolutionary and ecological forces that have





generated the patterns of biodiversity around us, through courses in organismal biology, evolutionary and systematic biology, population biology, ecology and ecosystem science.

An introductory course in conservation biology and one in problem solving in conservation biology familiarize students with the dimensions of the current biodiversity crisis and the management tools available to mitigate for it. These, in combination with a selection of advanced courses in conservation biology, a senior synthesis and an internship or research experience in conservation biology, cover the breadth of biological, social, political, and economic aspects of the biodiversity crisis.

The program prepares students for employment in a variety of government agencies at the municipal level (for example, as land use planners), state level (such as with the New York Department of Environmental Conservation or State Heritage Programs), federal level (such as with the U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, or National Park Service), and occasionally at the international level (such as with the United Nations Environment Programme). Many private conservation agencies such as The Nature Conservancy preferentially hire broadly trained conservation biologists. Ecological consulting firms are an increasingly important source of employment for conservation biologists. Training in conservation biology also provides a strong basis for postgraduate education and rewarding careers in research, teaching and environmental education.

## Construction Management

[www.esf.edu/scme](http://www.esf.edu/scme)

The construction industry represents almost 20 percent of the nation's gross domestic product, and the industry is very competitive. With more construction companies bidding on jobs, organizations with the best-prepared professionals using the latest technology are the most successful. Large construction projects such as power plants, office buildings or football stadiums can take years to build and are complex projects that require construction managers to keep the work on schedule and within budget. People engaged in this industry must have state-of-the-art skills and knowledge to thrive.

ESF's program provides a special focus on the use of sustainable construction practices and renewable building materials that is rarely found at other universities.

The objectives of the program are twofold: to study the various methods used to take a design into the field and construct a quality structure in the most efficient and effective manner with minimal environmental impacts and to provide an understanding of basic engineering and environmental considerations in construction.

Students learn the behavior of a wide variety of construction materials, including wood and engineered wood products, and study the analysis of various structural components and systems. Courses include

construction safety, sustainable construction methods, contracts and specifications, planning and scheduling, estimating, construction management, energy systems and sustainable materials, and computer applications, including building information modeling (BIM).

Environmental concerns are incorporated within the program by addressing workplace safety, environmental impact evaluation, and codes concerning structural, fire, and hazardous material requirements. Emphasis on environmental and personal safety includes asbestos mitigation, noise pollution, air monitoring and sampling techniques. Additional courses cover topics such as innovations in residential construction and green entrepreneurship. Energy efficiency in buildings is studied based upon the New York state energy conservation code and federal guidelines. Students may also choose a concentration in wood products engineering.

Graduates of the program are well prepared for careers in a challenging and dynamic field. Positions held by alumni include construction project manager, safety director, project engineer, construction engineer, field engineer, and planner/scheduler.

## Environmental Biology

[www.esf.edu/efb/envbio](http://www.esf.edu/efb/envbio)

The curriculum for the bachelor of science degree in environmental biology is built around a core of required courses that provides a general education, a background in the principles of biological and physical science, and an orientation to natural resources and other environmental concerns. A large number of elective credits allows each student to develop a unique plan of study, with the help of an assigned advisor. In keeping with the hands-on, field orientation of our curriculum, students also must complete six credit hours of field experience.

With appropriate electives, students who complete the degree program will meet requirements for a wide range of federal, state, municipal and private-sector positions that call for training in biological sciences. General subject requirements for graduate study in virtually any area of biology also will be met.

Environmental biology is the broadest of the seven biology majors at ESF, covering topics from molecules to ecosystems to regional landscapes, but nearly all the courses in the specialized areas are also available as electives. Sufficient elective space exists to allow completion of a minor during the four-year program. Students interested in marine biology also may complete courses in a SEA semester (see [www.sea.edu](http://www.sea.edu)). In choosing electives, some students sample from the widest spectrum of classes in environmental biology; this is common for those wishing to enter graduate school for further, career-oriented education. Other students focus their electives depending on their interests and career goals.

Through a special agreement with SUNY Oswego, students can couple biological sciences with graduate level education courses required to qualify for certification as biology teachers.

## Environmental Education and Interpretation

[www.esf.edu/efb/nhi](http://www.esf.edu/efb/nhi)

In recent years both the recognition of the role of biology in a holistic view of the planet, and the increasing emphasis on the value of education as the key to a sustainable future, have led to a growing number of students choosing to major in environmental education and interpretation. Interpretation is defined as a communications process that reveals meanings and relationships about natural, cultural, historical and recreational resources.

The courses associated with the undergraduate major reflect the interdisciplinary and holistic nature of this subject area. Students become well grounded in the natural sciences and in the skills specific to communication. This major seeks to integrate training in organismal biology, including a required field component, with in-depth training in the literature and context of natural history and a suite of environmental interpretation offerings. Students gain work experiences through an internship, where knowledge and skills in this arena can be applied.

The program prepares students for employment in nature centers, science museums, federal and state agencies, zoos, urban parks, arboreta and aquaria, as well as in the ecotourism industry and travel agencies that sponsor natural history opportunities, such as birding and whale watching. Training in natural history and interpretation also provides a strong basis for a rewarding career in teaching and environmental education and can act as a springboard for entry into graduate programs.

## Environmental Health

[www.esf.edu/environmentalhealth](http://www.esf.edu/environmentalhealth)

The bachelor of science in environmental health focuses on the study of how people interact with their environment: the air and water around us, the plants and animals we encounter, and the workplaces and homes where we spend much of our lives. The field is a broad one, encompassing both the direct effects of the environment on human health and the factors that could, in the long term, adversely affect the ecological balances that are essential to both human health and environmental quality.

This program educates students about the intersection of human health and the environment, specifically, the analysis, prevention and mitigation of potential environmental hazards that could be biological, chemical or physical. The program prepares students for employment in private industry, government agencies, and non-governmental agencies concerned with pollution abatement, protection of public health, and research in health science or advanced study in the science of environmental health or the allied health professions.

In addition to knowledge of the subject matter, graduates will have important skills in critical thinking and applied problem solving to help face current and future environmental threats. They will be well prepared for jobs in the currently understaffed environmental health workforce.

The program has been designed for accreditation by the National Environmental Health Science and Protection Accreditation Council.

Coursework for the environmental health major includes core courses in biology and general and organic chemistry, environmental health, information literacy, calculus; physics; environmental microbiology, environmental sampling methods, food safety and quality assurance, atmospheric sciences, epidemiology, environmental risk assessment and hazardous/solid waste management.

Students will also take courses in focus areas such as the built environment, geospatial technology, soils, water and wastewater and waste management, hydrogeology, and food production. A summer internship/professional experience and a senior synthesis are also required.

The outlook for students in the environmental health field is promising. Employment growth of nearly 30 percent is predicted by 2018, with 18 percent growth in New York, which is a leader in the field. Employment opportunities exist with public health departments, non-profit organizations, government agencies, private companies, environmental research corporations and state environmental health associations.

## Engineering at ESF

SUNY-ESF offers three undergraduate engineering programs with an environmental focus. Our programs tend to be more specialized than the engineering programs found at other colleges and universities. The chart below can help you match your interests in several common areas of engineering with the career-oriented and environmentally-focused degree programs offered at SUNY-ESF.

If you are interested in:	You should consider:
Bioengineering	Bioprocess Engineering
Chemical Engineering	Bioprocess Engineering or Paper Engineering
Civil Engineering	Environmental Resources Engineering
Environmental Engineering	Environmental Resources Engineering
Manufacturing Engineering	Paper Engineering
Polymer Engineering	Bioprocess Engineering



## Environmental Resources Engineering

[www.esf.edu/ere](http://www.esf.edu/ere)

The objectives of the Department of Environmental Resources Engineering are to prepare students who:

- will engage in professional engineering practice while employed by government agencies, industry and private consulting firms that specialize in public works and the inventory, management, design, use, restoration and protection of natural and cultural resources;
- are prepared to enter advanced academic studies involved with natural resources engineering, ecological engineering, mapping sciences and water resources; and
- will continue to develop the knowledge and skills needed to adapt to changing technological, environmental and business conditions to the benefit of society, employer and self.

A broad base of study in the fundamentals of engineering enables graduates to enter professional practices that focus on civil works as well as use and protection of soil, water, air and other renewable and nonrenewable resources to ensure sustainable development.

Emphasis in this unique program is placed on applications in resource inventory and evaluation; site analysis and development; environmental monitoring and impact assessment; environmental systems design, evaluation and management; structures and transportation systems; pollution abatement and residuals management; and environmental site remediation. The flexible curriculum allows students to also focus on traditional civil engineering practices if that fits their interests and goals.

Graduates of the program enjoy many benefits derived from their capstone-curriculum course in engineering planning and design. This project-oriented course serves to help the student integrate four years of education to solve complex design problems commonly encountered in professional practice.

Students with an interest in graduate study can plan their undergraduate studies to prepare themselves for ESF's master of science or Ph.D. programs in environmental and resource engineering. In this way, students who qualify will be admitted to the graduate program with minimal inconvenience or interruption in their studies. Graduates in search of additional education have also been admitted to outstanding engineering graduate schools throughout the country.

## Environmental Science

[www.esf.edu/environmentalscience](http://www.esf.edu/environmentalscience)

Environmental science at ESF is an interdisciplinary degree program that takes full advantage of its location within an environmentally-focused college. The program offers undergraduate students a tremendous variety of courses and faculty members to choose from, excellent facilities for research and field study, and a level of faculty expertise that is rarely found at other colleges.

The curriculum provides a strong foundation in the sciences and introduces students to the interdisciplinary breadth of environmental science through a selection of core courses dealing with the geographical, physical, social, and living environments. Students have the flexibility to satisfy their core requirements by completing courses in biology, chemistry, ecology, geography, engineering, forestry, environmental studies, and other areas of study. College-wide general education requirements provide additional opportunities for students to complete courses in the arts, humanities, and social sciences to develop a broader context for personal and professional growth.

Students in the junior and senior years of the program are able to focus more directly on professional courses that provide career preparation through a number of specialized options within environmental science. These options encourage students to develop career-related skills and expertise in areas such as environmental analysis, watershed science, environmental information and mapping, earth and atmospheric sciences, environmental engineering, environmental health, or renewable energy. The program option in health and the environment provides excellent preparation for graduate study in medicine or other health professions. Students may also develop self-designed minors in environmental science, or pursue a minor in another subject, to tailor their educational program to fit their personal goals.

Undergraduate students are encouraged to work closely with faculty members engaged in research and environmental problem-solving, and many choose to enter the College's nationally recognized graduate degree (M.S., M.P.S., Ph.D.) programs in environmental science. Teaching and research activities are supported by excellent laboratory, library and computing facilities available on the ESF campus and through Syracuse University. Faculty and students also benefit from a variety of field stations located on 25,000 acres of college-owned forest and wetlands.



## Environmental Studies

[www.esf.edu/es](http://www.esf.edu/es)

To address environmental issues, we must first understand the problems that underlie them. Because those issues and problems exist at the interface of complex human and natural systems, understanding them requires the right synthesis of scientific, social, and cultural knowledge.

Our program has been carefully designed to provide a comprehensive understanding of environmental affairs. That means learning about the scientific diagnosis of environmental issues and having enough scientific knowledge to work with scientists. It also means learning about the technological, social and cultural causes of those issues. Finally, it means understanding the diversity of approaches needed to treat the problems.

Because the environmental studies program is multidisciplinary, it provides students with a broad-based education. Graduates have gone on to graduate school in many disciplines as well as to law and medical school. They have also proceeded to work in nongovernmental organizations (NGOs), schools, government, and the private sector, pursuing careers in such areas as policy, advocacy, conservation, consulting, administration, law and education.

In the first two years of the program, students develop a foundation in the humanities, social sciences and natural sciences as they relate to environmental affairs. They also fulfill SUNY general education requirements and take open elective courses. In the final two years students pursue one of three specialization options described below.

In addition to the core environmental studies curriculum and specialization options, this program features:

- community engagement through service learning
- internships that provide valuable hands-on experience
- opportunities to study abroad for a semester

The value of a multidisciplinary environmental education is widely acknowledged by educators and professionals, and students in this major benefit from the tremendous variety of environmental courses and faculty at ESF.

### Environment, Communication and Society

This option focuses on the ways that communication influences environmental affairs, including rhetoric and discourse; news media; public participation; advocacy campaigns; collaboration; conflict resolution; risk communication; and representations of nature in literature and popular culture. This option provides a broad-based foundation in environmental communication theory and application. In addition to gaining a critical perspective, students obtain a range of skills including

oral presentation, nature and science writing, environmental journalism, multimedia, and collaboration. Students may also choose to emphasize environmental education, environmental ethics and values, or other cultural perspectives.

### Environmental Policy, Planning and Law

This option is concerned with how environmental policies are created, implemented and contested. It emphasizes legislative, regulatory, and collaborative approaches to environmental issues, and provides excellent preparation for students seeking admission to environmental law programs or entry to a variety of professional careers in business, government, or nongovernmental agencies.

Policies are guidelines for action found in laws, regulations, treaties, agreements, prescribed practices, professional standards, corporate strategies, operating procedures and personal codes of conduct. The study of environmental policy includes how policies come to be, how they are implemented, enforced, evaluated, and affirmed, rejected or revised. Environmental planning includes plan formulation and implementation strategies.

### Biological Science Applications

This option provides a solid background in the biological sciences pertinent to natural resources and ecosystems on one hand and a grounding in the social sciences on the other. In contrast to the traditional biology program, this option emphasizes the interaction of biological and societal issues. Our goals are to provide a sound background in biological sciences; foster a broad systems view of society, biological resources and ecosystems; develop a capacity to make independent judgments of environmental issues and enhance skills in communicating scientific/technical issues in sociopolitical settings.

### Undergraduate Minors

Students who meet eligibility requirements may complete a minor in marketing, entrepreneurship, or general management or other minors taught at ESF and Syracuse University. ESF offers a campus-wide minor in **urban environmental science** that allows students to gain the ability to identify and analyze the biophysical and social aspects of urban environmental issues. A minor in **environmental writing and rhetoric** is also a popular option.

## Forest Ecosystem Science

[www.esf.edu/fnrm/fes](http://www.esf.edu/fnrm/fes)

The bachelor of science in forest ecosystem science is based on a vision that combines professional competency in forest management skills with an enhanced understanding of ecological sciences. Students interested in this program typically are drawn to natural settings and environments, enjoy nature, and want to understand how forested ecosystems work. ESF provides a wide variety of opportunities to meet student needs utilizing 25,000 acres of forest lands as teaching laboratories. Internships with natural resource-based organizations in the business, public and nonprofit sectors provide additional hands-on experiences. Experiential field learning is combined with learning concepts and skills in the classroom and laboratory on ESF's Syracuse campus.

The program allows students to develop professional skills that employers look for in new employees. These skills are developed through a combination of core courses required in the undergraduate programs in forest resources management and in environmental biology. Forest ecosystem science offers a wide variety of employment opportunities. Graduates work throughout the United States in public agencies, private industry, and for nonprofit organizations. They also are well prepared



to enter graduate programs in management of natural resources, ecological research, or other areas of applied forest biology.

### Summer Program

A summer program is required for students in forest ecosystem science. The program is a four-week session that begins at the end of May and lasts through late June. It is taught at ESF's Wanakena Campus in the Adirondacks. Forest ecosystem science students must complete the summer program before the junior year. However, the summer program may be completed after the freshman year. We encourage students to complete the summer program early because it expands job opportunities.

## Forest Health

[www.esf.edu/efb/foresthealth](http://www.esf.edu/efb/foresthealth)

Forest health is a multidisciplinary and collaborative field of study that involves the understanding, monitoring and protection of the world's forest resources. A solid foundation in forest health requires expertise in many disciplines including, but not limited to, plant pathology, entomology, ecology, dendrology, mycology, silviculture, and forest management.

The forest health major prepares biology-oriented students for employment in positions that deal with maintaining the health of forest resources. The major is distinct from those in the Department of Forest and Natural Resources Management and its forest ecosystem science major, which provides skills and preparation in forest management. Employers today have expressed a need for a deeper understanding of the science behind the trees. Positions requiring a forest health background are found in federal and state agencies, nonprofit organizations and the private sector. The forest health major prepares students for graduate study in preparation for higher-level positions, such as forest pathologist, entomologist or mycologist.

The curriculum provides a solid foundation in mathematics and the physical sciences (chemistry, physics) followed by courses focusing on forest trees and their requirements, the basic ecological principles that shape forest ecosystems, and the management of these ecosystems. Other required courses introduce students to the identification and impact of biological agents of disease and physical damage and to the methods by which these are monitored. The flexibility of the major will permit students to pursue more intensive training in integral forest health specialties, such as forest pathology and forest entomology, or to obtain even broader knowledge in related fields such as forestry, microbiology, mycology, and ecology. Field experience is an important element of the program and is integral to several required courses and many of the directed electives. Two of the requirements are field courses at the Cranberry Lake Biological Station.



## Forest Resources Management

[www.esf.edu/fnrm/frm](http://www.esf.edu/fnrm/frm)

Professional forestry education has been featured at ESF since the College's founding in 1911. Today's forest resources management program is based on a clear vision that combines professional competency with a strong foundation in the biophysical sciences, humanities, and social sciences to meet society's needs for forest managers.

Many ESF students enjoy trees and forests and want to work in forested settings. They appreciate nature and want to master the knowledge and skills needed to conserve and manage forests and the environment. With 25,000 acres of College forest lands as teaching and research laboratories, ESF provides many opportunities to meet student needs for experiential learning. The associate degree program at ESF's Ranger School campus prepares students for careers in field forestry and is a route to the forest resources management program that emphasizes field practice. Internships with forest-based organizations in the private, public and nonprofit sectors amplify these hands-on experiences. Practical experience is combined with learning concepts and problem solving and critical thinking skills in the classroom and laboratory on ESF's Syracuse campus. The educational outcomes of ESF's forest resources management degree program are among the best anywhere in North America.

Forest resources management is an integration of forest ecology and biology, forest measurements, forest policy and administration, and courses to predict and evaluate the effects of manipulation. Timber, water, recreation, wildlife, and a broad array of environmental values and services, such as biodiversity and healthy forest systems, are important results of effective management. This major prepares students to be well-rounded generalists who can practice forestry and succeed as professionals in a variety of allied natural resource management fields.

**The bachelor of science program in forest resources management is accredited by the Society of American Foresters (SAF). SAF is recognized by the Commission on Recognition of Postsecondary Accreditation as the specialized accrediting body for forestry in the United States.**

Our graduates are working throughout the United States as professional foresters and natural resource managers in public agencies, private industry and for nonprofit organizations.

## Summer Program

A summer program is required for students in forest resources management. The program is a four-week session that begins at the end of May and lasts through late June. It is taught at ESF's Ranger School campus in the Adirondacks. Students must complete the summer program before the junior year. However, the summer program may be completed after the freshman year. We encourage students to complete the summer program early because it expands job opportunities.

## Program Admission

Students may follow one of three paths to enter and complete the forest resources management program:

- The freshman path is for students who enter ESF as freshmen and complete all degree requirements at ESF with the Summer Program after the first or second year (first year preferred).
- The combined A.A.S./B.S. path is for students who wish to have more field measurement and field problem-solving skills and leadership development in context of forestry problems. The first year can be at ESF or another college and the second year is spent at ESF's Ranger School, Wanakena campus. Students then complete their B.S. degree requirements at ESF. This path can usually be completed in four years.
- The transfer path is for students who complete all or part of their lower-division (freshman and sophomore year) coursework at another two- or four-year campus, attend the Summer Program in the summer before entering ESF and complete the upper-division requirements for the B.S. degree at ESF.

## Environmental and Natural Resources Conservation

[www.esf.edu/rangerschool](http://www.esf.edu/rangerschool)

The two-year associate degree program in environmental and natural resources conservation provides students with the scientific theory and applied skills necessary for a technical career in the environmental and natural resources sector. This program will provide students with a solid grounding in applied ecological and sociopolitical concepts, accompanied by technical training in plant and tree identification, land surveying, natural resources measurements, geospatial applications, soil and water monitoring, wildlife techniques, and forest recreation.

Please see [www.esf.edu/rangerschool](http://www.esf.edu/rangerschool) for additional information.



## Forest Technology

[www.esf.edu/rangerschool](http://www.esf.edu/rangerschool)

This two-year associate degree program provides students with knowledge of the field practice of forest management, the ability to work and communicate effectively with professional and paraprofessional personnel, and an understanding of the physical, biological and quantitative aspects that form the basis of forestry.

Please see [www.esf.edu/rangerschool](http://www.esf.edu/rangerschool) for additional information.

## Land Surveying Technology

[www.esf.edu/rangerschool](http://www.esf.edu/rangerschool)

Many graduates of SUNY-ESF's Ranger School find the land surveying profession to be an exciting, challenging and rewarding career choice. As land values increase, technology advances, and laws and regulations become more complex, the education of land surveyors has become increasingly important. This program was developed to address the current educational needs of the student interested in pursuing a career in surveying, as well as the needs of surveying employers. Students who choose this two-year associate degree will be exposed to the fundamentals of forest technology that are important to the land surveyor and will receive a more in-depth education in the area of surveying technology.

Please see [www.esf.edu/rangerschool](http://www.esf.edu/rangerschool) for additional information.

## Landscape Architecture

[www.esf.edu/la](http://www.esf.edu/la)

The Bachelor of Landscape Architecture (B.L.A.) program is designed for those students desiring to enter the profession of landscape architecture either directly after completing the degree or after completing graduate school. This is a professional degree with an emphasis on the skills and knowledge required to qualify as a landscape architect.

The degree is granted at the end of five years of study and requires the successful completion of 150 credit hours and a one semester off-campus program. Students are accepted into the program as freshmen or as transfers.

**The B.L.A. degree is accredited by the American Society of Landscape Architects (ASLA).**

The undergraduate curriculum consists of two broad categories of courses. The first category, general education, provides students with knowledge and skills that are useful and important for all educated persons, regardless of their profession, as well as preparation for advanced courses leading to a specific profession. The second category, professional courses, provides students with direct preparation for a career through practice and application of the basic principles and skills of landscape architecture design, land manipulation and engineering, applied ecology, planning and communications.

Studio instruction holds a special place within the program because it mimics the professional environment where students will integrate these principles and skills in order to solve landscape architectural problems. The number of students in a studio section is normally limited to 15 because this type of problem-based learning relies on intensive interaction and mentoring relationships with studio faculty.

The major objective of the program is to develop basic proficiency in the design, engineering and communication skills necessary for formal admission into the profession of landscape architecture. When the prerequisite period of work experience has been completed, a person



holding a B.L.A. degree may apply to take the examination leading to a license to practice landscape architecture. At present, the State of New York requires those holding a five-year B.L.A. degree to complete a three-year period of internship in the field prior to applying for the licensing examination. Other states have varying requirements.

Students receiving a B.L.A. degree have entered the profession as employees in public agencies, not-for-profits, or in private offices offering landscape architectural services. They have entered graduate schools in landscape architecture, planning, urban design, regional design, and specific specialties including historic preservation, environmental policy, public administration, recreation and management.

### Off-Campus Program

The off-campus program is the Department of Landscape Architecture's undergraduate centerpiece and one of the most unique educational programs within the State University of New York. Since 1970, more than 1,300 students have studied landscape architecture off campus in more than 50 different countries and throughout the United States.

The off-campus program is centered on the idea of an "experiential studio." Prior to the off-campus semester, students identify a particular design-related study topic, then develop plans to leave the traditional university setting and travel to locations uniquely suited to the topic. Studies may take any of several forms—they may be relatively independent, focusing on a particular student's interests and aspirations (self-described study); they may be directed by a faculty member's interests or research (faculty-described study); or they may be more applied and directed by a local group or organization on site, similar to an internship arrangement (work study). Each off-campus group is coordinated and advised by a participating faculty member, and assisted by an on-site consultant (usually a local alumna or alumnus, landscape architect, or university professor). Each student spends a full, 15-week semester "off-campus" pursuing the study, earning 15 credit hours. Typically the off-campus study is undertaken during the fall semester of the fifth year.

### Portfolios

Freshman applicants are not required, but are highly encouraged to submit a portfolio of their creative work for review. Transfer applicants seeking greater than first semester sophomore standing are required to submit a portfolio as a part of their application for admission.

Faculty members embrace a broad conception of the term “creative work,” ranging from pencil sketching to poetry; however, for the purpose of indicating an aptitude for landscape architecture, portfolio work should focus on visually expressive examples, including both traditional and digital media. Submittals will be used to assess drawing and other graphic communication skills, as well as spatial awareness and the ability to visualize and convey design ideas. Portfolio items should be no larger than 11-by-17-inch, generally consisting of good-quality photographic or xerographic reproductions, or in Adobe PDF, PowerPoint, or JPEG digital format on standard CD-R, CD-RW, or DVD media. Color slides or prints of large or 3-D work, or digital HTML “Web page” portfolios are also acceptable. Applicants should not send original artwork. Portfolios can be returned if accompanied by a self-addressed, pre-posted return envelope.

## Natural Resources Management

[www.esf.edu/fnrm/nrm](http://www.esf.edu/fnrm/nrm)

The natural resources management program combines professional competency in management skills with a strong foundation in the social and biophysical sciences. Students interested in this program typically are drawn to natural settings and environments, enjoy nature, and want to develop the professional knowledge and skills needed to conserve, steward and manage natural resources and the environment. ESF provides a wide variety of opportunities to meet student needs utilizing 25,000 acres of forest lands as teaching laboratories and College faculty in many natural resource management disciplines. Internships with natural resource-based organizations in the business, public and nonprofit sectors provide additional hands-on experiences. Experiential field learning is combined with learning concepts and skills in the classroom and laboratory on ESF’s Syracuse campus.

The program allows students to develop professional skills through a broad base of classes in the natural sciences, social sciences and humanities, communication, and quantitative and qualitative problem-solving skills; prepares students to be well-rounded natural resources managers and prepares them with a foundation for future graduate degree work.

Natural resources management offers a wide variety of employment opportunities. Graduates work throughout the United States in public agencies, private industry and for nonprofit organizations. Their duties range from policy analysis for federal agencies to resource managers for nonprofit organizations; from recreation planning for state park agencies to recreation management in federal wilderness areas; and from watershed hydrologists to land managers maintaining surface water quality.

As human demands on the environment increase, society needs managers that understand the economic, demographic, social and political issues that drive resource use allocation. Students learn how to integrate and balance the complexities of managing both resources and people recognizing that resource decisions involve value-driven conflicts.

Students are encouraged to enroll in one of the three ESF management minors: general management studies, entrepreneurship, or marketing. These minors provide students with professional groundwork in business administration, such as accounting, finance, entrepreneurship, marketing and human resources. Managers use this foundation for effective and efficient management and for successful program implementation.

Students may customize their program of study by focusing on a particular resource or group of resources. Graduates have the knowledge and skills necessary to work in a variety of managerial, legislative, regulatory, and other positions for environmental consulting firms,



nonprofit organizations, public agencies, and industry. Graduates may also choose to pursue further studies in a variety of disciplines, including policy, law, administration, or biological processes.

### Minor in Recreation Resource Management

This minor provides students with the opportunity to combine visitor management with protected area management. Understanding the need to balance the opportunity for visitor experiences with protecting and stewarding protected areas provides professional insight into planning and managing those areas for limited visitor access. Protected area managers need to be able to manage both the resource itself as well as a wide variety of users, such as campers, hikers, bird watchers, boaters, nature photographers and others who enjoy nature-based experiences in extensive protected area environments owned by public agencies, private landowners, or NGOs.

### Minor in Water Resources

Water resources is a multidisciplinary field that integrates the physical, geochemical and biological processes of the water cycle and their application to management of water resources. Although study in water resources has traditionally been distributed among different disciplines, such as natural resources management, engineering, biology and chemistry, the most compelling issues in water resources lie at the interface between these traditional disciplines. The interdisciplinary minor in water resources provides an opportunity for students to study and integrate principles of physical hydrology, geochemistry, aquatic and terrestrial ecology, and natural resources management.

### Summer Program

A summer program is required for students in natural resources management. The summer program is a four-week session that begins at the end of May and lasts through June. It is taught at ESF’s Ranger School campus in the Adirondacks.

Students must complete the summer program before the junior year. However, the summer program may be completed after the freshman year. Students are encouraged to complete the summer program early because it expands job opportunities.

### Program Admission

Students may follow one of three paths to enter and complete the natural resources management program:

- The freshman path is for students who enter ESF as freshmen and complete all degree requirements at ESF with the Summer Program after the first or second year (first year preferred).

- The combined A.A.S./B.S. path is for students who wish to have more field measurement and field problem-solving skills in the context of forestry problems. The first year can be at ESF or another campus and the second year is spent at The Ranger School. Students then complete B.S. degree requirements at ESF. This path can usually be completed in four years.
- The transfer path is for students who complete all or part of their lower-division (freshman and sophomore year) coursework at another two- or four-year campus, attend the Summer Program the summer before entering ESF, and complete the upper-division requirements at ESF. Students preparing to transfer to ESF with full junior status must have earned at least 60 credits of college coursework.

## Paper Engineering

[www.esf.edu/pbe](http://www.esf.edu/pbe)

The paper industry is renewable and sustainable, and employment prospects are bright. ESF's paper engineering program is designed to provide greater depth in chemical engineering education for students preparing for an engineering career in the pulp, paper, and allied industries as well as other industries. Students graduating from this program are well suited for employment as process engineers as well as many other career opportunities. Graduates are prepared to move into assignments in the engineering field and advance quickly to positions of responsibility in the analysis and design of processes, products and equipment.

Courses present the principles of engineering with topics and examples selected especially for the pulp and paper industry. Courses include study in the basic sciences – chemistry, physics, computer science – as well as engineering topics such as statics and dynamics, mechanics, thermodynamics, transport phenomena, electricity, and design. The general education component, which is required of all ESF students, broadens the students' perspectives on global and societal issues, an important component of any education. The engineering courses cover a variety of topics that are traditional for a chemical engineering program, supplemented with courses specific to paper engineering.

Students in the program gain valuable experience through a capstone design experience in which they work on significant problems in the design and implementation of new technologies, typically in conjunction with a local recycled-paper mill. In addition, a summer internship is required of all students in which they gain valuable skills and experience in terms of technical knowledge and professional development. Paper engineering students can also work in paid cooperative education (co-op) positions with participating companies. These experiences serve to integrate the knowledge gained in coursework with real-world work experiences commonly seen in positions after graduation.

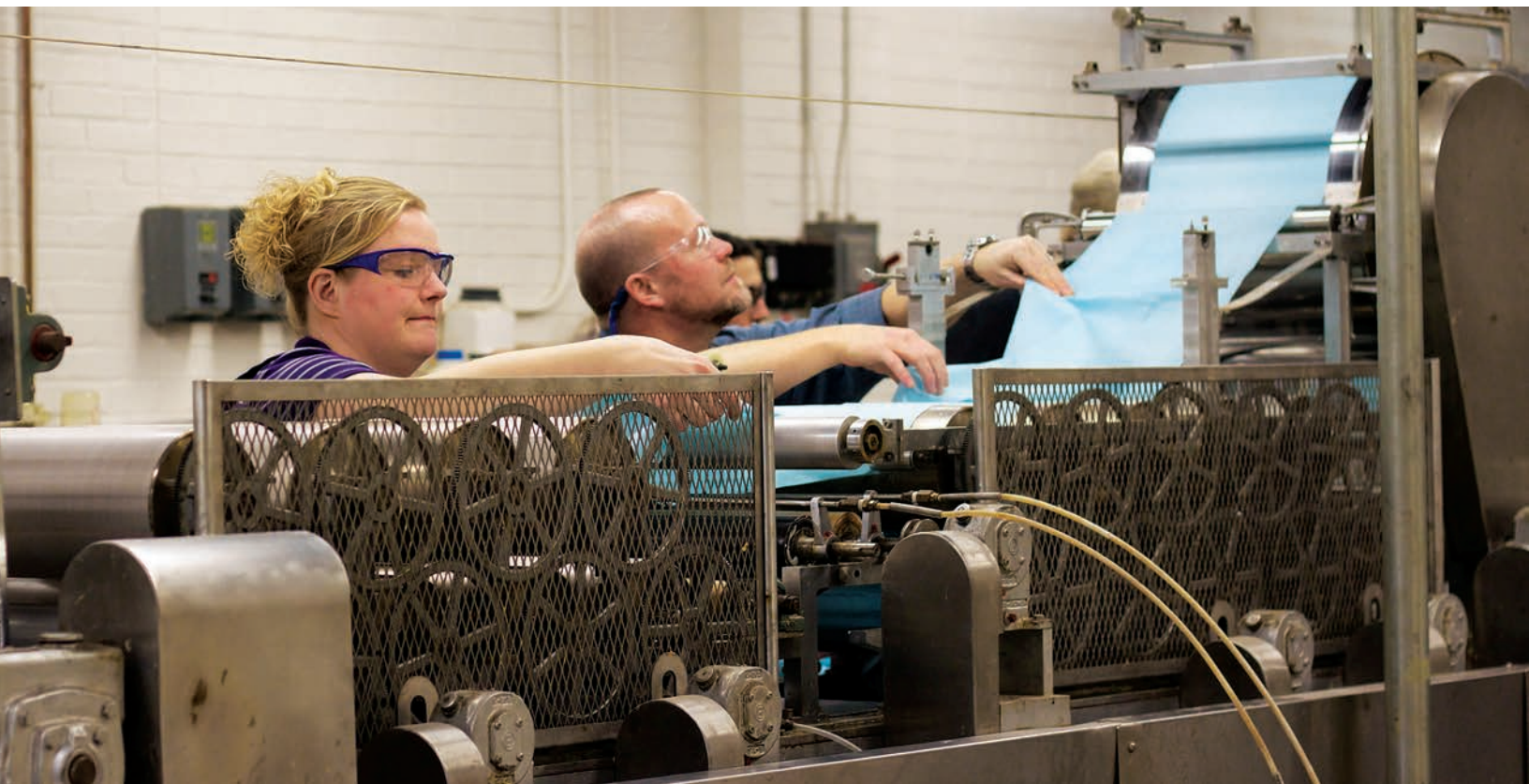
Students may enter the bachelor of science program as first-year students or as transfer students. Students who have the associate degree in engineering science, chemical technology, general engineering, chemistry, or general science and mathematics are encouraged to apply as transfer students.

### Internships and Co-ops

Paper science and paper engineering students enjoy the advantage of hands-on learning in the pulp, paper, and allied industries through paid internships and co-ops. All students are required to complete a two-credit, 12-week summer intern program in the industry (PSE 304). Internships provide students with valuable experience, financial benefits, and two credits toward graduation. Students must submit a mill report for completion of the internship.

Students who complete a co-op in addition to the 12-week internship find the experience highly valuable because they are often able to see engineering projects through to their completion. Generally, students who have had the co-op experience are recruited for permanent employment.

The co-op position is approximately seven months in duration, either beginning in May and ending in December, or beginning in January and ending in August. Usually it takes students who complete a co-op one extra year to complete degree requirements. Co-op students are enrolled for two credits and are required to submit a co-op project report in addition to the mill report required for the two-credit summer internship course.



## Paper Science and Engineering Scholarships

Scholarships from the Syracuse Pulp and Paper Foundation, Inc. are awarded to undergraduate students majoring in paper science or paper engineering who are United States citizens or permanent residents. All entering freshmen are awarded a partial scholarship for their first year. Awards for transfer and continuing students are based on GPA.

### Paper Science

[www.esf.edu/pbe](http://www.esf.edu/pbe)

The paper science program allows those students who are more science focused to prepare for careers in the pulp, paper, and allied industries. Students graduating from this program are well-suited for employment in many different facets of these industries as well as in applications of chemistry and biology.

The program consists mainly of chemistry, some engineering courses, and specialized courses relating to the manufacture and use of pulp and paper products. Option electives allow the student to specialize in a subject area of interest. This program prepares the student for careers in the technical, management, or technical representative areas with opportunities to extend interests in other directions.

Students may be admitted to the paper science program as first-year students with appropriate science backgrounds from their high school or as transfers at any level with accommodations for coursework requirements. Students who have the associate degree in engineering science, chemical technology, or science and mathematics are encouraged to apply as transfer students.

Students completing the paper science program must complete 15-18 credits of technical electives in order to satisfy graduation requirements. This technical elective requirement can be satisfied by completing an approved minor or concentration area.

### Sustainable Energy Management

[www.esf.edu/frnm/sem](http://www.esf.edu/frnm/sem)

ESF has developed one of the nation's first Bachelor of Science programs in Sustainable Energy Management (SEM). This program is structured to introduce students to a wide range of energy markets and resources (fossil fuels, electricity, renewable and sustainable energy resources) while providing substantial flexibility for student-centered learning in understanding and managing energy systems. The program combines professional competency in management with a strong foundation in the social and biophysical sciences.

The study of responsible energy resources use, and the development of sustainable sources of energy, has become a critical national and global issue. Energy issues include concerns about the quality and quantity of potential energy resources, energy security, and potential impacts on the environment and human health. Our society needs energy professionals who understand the production and conversion of different forms of energy, their current and future supplies, the markets and public policy mechanisms that regulate their supply, and the environmental impacts for each fuel.

SEM students will develop a broad understanding of ecosystems and natural resources, coupled with specific skills in measuring and managing energy resources. They will understand the variety of government and organizational policies impacting the energy industry and energy consumers and be prepared to communicate and advocate for effective policies and regulations. Career opportunities are growing significantly in sustainability management, energy pricing and sales, energy planning, and related fields, and SEM graduates will succeed in these careers.



### Wildlife Science

[www.esf.edu/efb/wildlife](http://www.esf.edu/efb/wildlife)

Wildlife science is the application of ecological knowledge in a manner that strikes a balance between the needs of wildlife populations and the needs of people. Research and teaching in wildlife science began at ESF in 1914, one of the first such programs in the U.S. and was quickly followed by establishment of the Roosevelt Wild Life Station in 1919. Today, our program is recognized nationally and internationally, and our graduates are employed worldwide. The focus is applied ecology, and students engage the environmental challenges associated with managing wildlife, ranging from endangered species to overabundant populations. The program recognizes and accommodates the fact that wildlife scientists increasingly must deal with all forms of wildlife, including plants and invertebrates, and the scope is becoming more international.

Students obtain background in the basic sciences (math, chemistry, physics), then learn the basic ecological principles and evolutionary forces that affect wildlife and their associated habitats. Coursework then addresses the assessment and management of wildlife resources as well as the biology and natural history of various taxonomic groups. Students are advised to enhance career opportunities via taxonomic proficiency with one or more plant or animal groups, special skills such as GIS, and practical working experience as an intern, volunteer or paid employee of a conservation agency.

The program prepares students for careers with state and federal agencies as well as an array of domestic and international non-governmental organizations. Diverse job functions include management of wildlife on state, federal or private lands; inventory and assessment of wildlife populations and associated habitats; and interaction with the public to convey the value and rationale of wildlife conservation programs and initiatives. Students who excel academically will also be prepared to continue toward a graduate degree, which can greatly expand employment opportunities and is often necessary for even entry-level, career-track positions.

Undergraduates in wildlife science take advantage of ESF's field stations, which are unmatched nationally and provide myriad opportunities. These properties include the 15,000-acre Adirondack Ecological Center and the Cranberry Lake Biological Station in the Adirondacks, as well as the Heiberg Forest south of Syracuse. Many of the courses taken by wildlife science undergraduates include field exercises at these facilities, and the properties are also used for undergraduate research and other projects in which undergraduate students can become involved.



## Special Academic Opportunities

There are a variety of special academic opportunities available at SUNY-ESF to complement your chosen degree program. Here are a few of the special programs available to undergraduate students.

### Minors at ESF

Completion of a minor at ESF generally requires the completion of a structured set of five to six academic courses (15-18 semester hours). The College currently offers minors in applied statistics, bioprocess science, biotechnology, chemistry, computer and information technology, construction management, economics, environmental writing and rhetoric, paper science, recreation resource management, renewable energy, urban environmental science, and water resources.

### Minors at Syracuse University

Minors in entrepreneurship, general management, or marketing are available to ESF students through an agreement with Syracuse University's School of Management. Participating students pay SUNY tuition charges for their required courses.

### Science Teacher Certification

ESF and the School of Education at SUNY Oswego offer students majoring in environmental biology or chemistry the opportunity to prepare for N.Y. state teacher certification in biology or chemistry. Students complete required education courses through SUNY Oswego and complete an MAT or MST degree.

### Joint Programs with Upstate Medical University

ESF students may enter a cooperative 3+3 program to gain admission to the Doctor of Physical Therapy program at SUNY Upstate Medical University, which is located in walking distance of the ESF campus. Additional opportunities exist for junior year transfer into seven health-related professional programs at UMU. Outstanding freshman applicants to ESF can also apply for admission to UMU's College of Medicine, through a coordinated BS/MD program.

### Internships

Undergraduate students can explore their interests and career options through a variety of internships on campus, in the Syracuse area, or around the country. Internships and other experiential learning opportunities are available to students in every ESF major.

### Service Learning

ESF students contribute to the larger community through a selection of more than 60 service-learning courses that provide real world experience, college credits, and the satisfaction of helping others while you solve environmental problems. ESF ranks among the top 10 percent of U.S. colleges for student participation in service learning.

### Pre-law Program

The College has a well-established program to prepare students for admission to law schools and is an outstanding choice for students interested in the growing field of environmental law.

### Pre-Health Professions

Students interested in preparing for admission to medical, dental or veterinary schools most often major in biology, biotechnology, chemistry, environmental health or environmental science at ESF. The College has transfer agreements and a coordinated admission program with nearby SUNY Upstate Medical University.

### Honors Program

The Honors Program provides opportunities for first- and second-year students to schedule several honors-level general education courses, including a special selection of honors courses taught at Syracuse University. The junior and senior years of the program are focused on research and require completion of an Honors Thesis or Honors Project. All applications for freshman admission are reviewed for potential admission to the Honors Program.

### Study Abroad

ESF students have access to the internationally recognized study abroad program at Syracuse University and several additional ESF programs. More than 20 percent of ESF students typically study abroad.

# ESF Regional Campuses



Students at SUNY-ESF study the environment on more than 25,000 acres of forest, lake and river properties owned by the College.

## 1 The Tully Campus

4,000 Acres

Consists of the Heiberg Forest and the Tully Field Station. Located 25 miles from the College's main campus in Syracuse, the forest is used for field research, instruction and demonstration sites.

## 2 LaFayette Road Experiment Station

44 Acres

This experiment station houses the College arboreta, greenhouses and a tree nursery and contains both plantations and natural tree stands.

## 3 Thousand Islands Biological Station

1.5 Acres

Located on an island in the scenic St. Lawrence River, TIBS provides a setting for research that focuses on aquatic ecology.

## 4 The Ranger School

2,800 Acres

On the shore of the Oswegatchie River in the Adirondacks, SUNY-ESF's Ranger School offers three associate degree programs and a summer program in forestry.

## 5 Cranberry Lake Biological Station

1,000 Acres

Accessible only by boat, this field station hosts a summer program for biology students and independent research projects by visiting scientists.

## 6 The Newcomb Campus

15,000 Acres

This facility includes the Adirondack Ecological Center, the Adirondack Interpretive Center and the Huntington Wildlife Forest.

## 7 Pack Demonstration Forest

2,400 Acres

This forest is the home of the DEC's Environmental Education Camp and several miles of hiking trails, one of which is accessible to people using wheelchairs.



## Sundt Field Station, Costa Rica

30 Acres

This international field station located near the Pacific coast supports studies in tropical forestry and wildlife.





State University of New York  
College of Environmental Science and Forestry

Undergraduate Admissions  
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